

REMARKS

Claims 1, 2, 4-7 and 11-13 are pending in the present Application. Claims 1, 6 and 11 have been amended, leaving Claims 1, 2, 4-7 and 11-13 for consideration upon entry of the present Amendment. Support for the proposed amendments to independent claims 1, 6 and 11 is at least found at page 8, lines 6-30 of the specification, as originally filed, and FIG. 1. No new matter has been introduced by these amendments or new claims.

Reconsideration and allowance of the claims are respectfully requested in view of the above amendments and the following remarks.

Rejections under 35 U.S.C. §103

Choi et al. in view of Kim et al.

Claims 1, 2 and 5-7 stand rejected under 35 U.S.C § 103(a) as being allegedly unpatentable over Choi et al. (U.S. Patent No. 6,231,672 B1, hereinafter “Choi”) in view of Kim et al. (U.S. Patent No. 6,656,282 B2, hereinafter “Kim”). The Examiner states that Choi discloses all of the elements of the abovementioned claims except for, (1) *a radical supply unit for generating corresponding radicals by applying plasma to a second reactive gas and then selectively supplying the radicals to the reaction chamber or the exhaust line; a radical transfer line for connecting the radical supply unit and the reaction chamber and for transporting a main purge gas; a second bypass line for connecting the radical supply unit and the exhaust line; the radical supply unit comprises an MFC 2 for controlling the flow rate of the second reactive gas; a remote plasma generator to which the MFC 2 and the MFC 3 are connected such that the second reactive gas and/or the inert gas are fed to the remote plasma generator, the remote plasma generator generating corresponding radicals by applying plasma to the second reactive gas and/or the inert gas; an open/close valve installed between the MFC 2 and the remote plasma generator of claim 1; (2) a radical transfer line of claim 5; (3) radicals are fed into the reaction chamber and that the deposition process is repeated of claim 6; and (4) after depositing a thin film, further comprising injecting radicals and an inert gas into the reaction chamber to thermally treat the thin film, wherein the radicals are formed of at least one selected from the*

group consisting of O, N, H, OH and NH and a combination thereof of claim 7, which the Examiner further states are disclosed primarily at FIG. 3 and column 3, lines 5-7, column 4, lines 60-67, column 5, lines 20-30 and column 5, lines 60-67 of Kim.

Choi is directed to an apparatus for depositing thin films of a semiconductor device. (See Abstract). The apparatus includes a reaction gas transfer portion 1000 for transferring a reaction gas to a reactor 200 and an exhaust portion 1300 for discharging the reaction gas out of the reactor 200. (See Col. 2, line 66 through Col. 3, line 4). Choi discloses that the reaction gas transfer portion 1000 includes a first reaction gas supply portion 1110 for supplying a first reaction gas to the reactor 200, a second reaction gas supply portion 1120 for supplying a second reaction gas to the reactor 200 and an inert gas supply portion 1130 for supplying an inert gas to the reactor 200. (See Col. 3, lines 6-19). Choi also discloses that the exhaust portion 1300 has an exhaust pump 310 for discharging the gas out of the reactor 200. (*Id.*) Choi further discloses that the first, second and third gas supply portions 1110, 1120 and 1130 and the exhaust pump 310 are connected by pipe lines having a plurality of on/off valves 111, 112, 113, 114, 115, 121, 122, 123, 124, 125, 131, 132, 133 and 134, which are controlled by a connector connected to each of the valves. (*Id.*)

Kim is directed to a reactive gas feeder for use in an atomic layer deposition apparatus using remote plasma. (See Col. 4, lines 19-37). The reactive gas feeder includes a plurality of transfer pipes 15 for guiding a first reactive gas, a second reactive gas and a carrier gas into a vacuum chamber 4. (*Id.*) Kim discloses that the reactive gas feeder further includes a valve controller 30 to feed a carrier gas (considered the “inert gas”) to purge the reactive gas atmosphere at each process after feeding the first and second reactive gases. (See Col. 4, lines 39-43).

The Examiner has provided a schematic drawing allegedly representing the disclosure of Choi combined with the disclosure of Kim, in order to arrive at the claimed invention. However, in reviewing the above-mentioned rejections and the schematic drawing provided by the Examiner, it is respectfully submitted that Choi and Kim, either alone or in combination, fail to teach or suggest a remote plasma generator to which the MFC 2 and the MFC 3 are connected such that the second reactive gas and the inert gas are fed to the remote plasma generator, the remote plasma generator generating corresponding radicals by applying plasma to the second

reactive gas and the inert gas...wherein the second reactive gas and the inert gas are mixed with each other prior to being fed to the remote plasma generator of amended independent claims 1 and 6.

Instead, as clearly illustrated in FIG. 3, Kim merely discloses that the plasma generator 7 and the mass flow controller MFC2 are connected such that the carrier gas (considered the “inert gas”) is provided downstream from the plasma generator 7, contrary to the claimed invention. Furthermore, with respect to the schematic drawing provided by the Examiner, the inert gas and the NH₃ or H₂ (considered the “reactive gas”) are independently provided to the remote plasma generator. That is, Choi and Kim, alone or in combination, fail to teach or suggest that the second reactive gas and the inert gas are mixed with each other prior to being fed to the remote plasma generator of amended claims 1 and 6.

Therefore, Choi and Kim, alone or in combination, fail to teach or suggest all of the elements of independent claims 1 and 6. Thus, claims 1 and 6, including claims depending therefrom, i.e., claims 2, 4, 5 and 7, define over Choi in view of Kim.

Accordingly, it is respectfully requested that the rejection to claims 1, 2 and 5-7 under § 103(a) be withdrawn.

Choi et al. in view of Kim et al. and further in view of Xia et al.

Claims 4, 11, 12 and 13 stand rejected under 35 U.S.C § 103(a) as being allegedly unpatentable over Choi in view of Kim, and further in view of Xia et al. (U.S. Patent No. 6,258,735, hereinafter “Xia”). The Examiner states that Choi discloses all of the elements of the abovementioned claims except for, (1) *an atomic film deposition method using the remote-plasma atomic film deposition apparatus of claim 1, the method comprising forming a thin film on a substrate loaded in the reaction chamber by repeatedly performing a radical feeding step in which radicals are fed into the reaction chamber, a radical purge step in which the radicals are purged from the reaction chamber, wherein the radical purge step comprises injecting only a radical corresponding to the inert gas (excluding the second reactive gas), which flows through the remote plasma generator, into the reaction chamber by way of the radical transfer line of claim 11; (2) wherein the sum of the flow rate of the inert gas flowing through the first reactive*

gas transfer line and the second reactive gas transfer line is maintained at a constant level during the first reactive gas purge step of claim 12; and (3) after depositing a thin film, further comprising injecting radicals and an inert gas into the reaction chamber to thermally treat the thin film, wherein the radicals are formed of at least one selected from the group consisting of O, N, H, OH and NH and a combination thereof of claim 13, which the Examiner further states are disclosed primarily at FIGS. 2 and 3 and column 2, lines 34-53, column 3, lines 11-22, column 3, lines 40-41 and column 5, lines 15-28 of Kim and FIG. 1 of Xia.

Xia is directed to a method of depositing a carbon doped silicon oxide film having a low dielectric constant (k). (See Abstract). Xia discloses a chemical vapor deposition reactor 10 having a high vacuum region 15. (See Col. 3, lines 58-60). Xia also discloses that the deposition process performed in the reactor 10 can be either a thermal process or a plasma enhanced process. (See Col. 4, lines 31-45). Xia further discloses that, in the plasma enhanced process, a controlled plasma is formed adjacent to a wafer by RF energy. (*Id.*) However, Xia also fails to teach or suggest that *the second reactive gas and the inert gas are mixed with each other prior to being fed to the remote plasma generator* of amended independent claims 1 and 11. In addition, Xia fails to cure the deficiencies with respect to Choi and Kim, as discussed above.

Therefore, Choi, Kim and Xia, either alone or in combination, fail to teach or suggest all of the elements of independent claims 1 and 11. Thus, claims 1 and 11, including claims depending therefrom, i.e., claims 2, 4, 5 and 12-13, define over Choi in view of Kim and in further view of Xia.

Accordingly, it is respectfully requested that the rejection to claims 4 and 11-13 under § 103(a) be withdrawn.

Conclusion

It is believed that the foregoing amendments and remarks fully comply with the Office Action and that the claims herein should now be allowable to Applicants. Accordingly, reconsideration and withdrawal of the objection(s) and rejection(s) and allowance of the case are respectfully requested.

If there are any additional charges with respect to this Amendment or otherwise, please charge them to Deposit Account No. 06-1130.

Respectfully submitted,

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Date: October 27, 2007